

**WHAT IS CLAIMED IS:**

1. A slide drive device for a press machine, comprising:  
a slide;  
said slide includes a top and a bottom dead center position;  
5 adjusting means for permitting adjustment of a stroke of said slide;  
said adjusting means simultaneously adjusting said top and bottom dead  
center positions by a same amount; and  
said adjusting means being located at the same location on said press  
machine.
- 10 2. A slide drive device, according to claim 1, further comprising:  
driving means for driving of said slide drive device;  
at least a first upper link;  
said first upper link being connected to drive said slide in said cycle;  
said driving means transmitting a driving displacement to said first upper  
15 link to drive said slide in said cycle; and  
said means for driving transmitting said adjustment to said slide whereby  
said stroke is adjusted.
- 20 3. A slide drive device, according to claim 2, further comprising:  
dynamically balancing means for permitting dynamic balancing of said  
slide drive device;  
a dynamic balancer operably connected to said slide;  
said dynamically balancing means connected to said dynamic balancer;  
said dynamically balancing means being operably connected to move said  
dynamic balancer opposite said slide in said cycle;

said means for driving connected to transmit said driving displacement to said dynamically balancing means; and

said dynamically balancing means moving said dynamic balancer opposite said slide in said cycle whereby said dynamic balancer operates to dampen vibration from said slide.

4. A slide drive device, according to claim 3, further comprising:  
guiding means for guiding of said slide drive device;  
at least a first horizontal link;  
said first horizontal link operably connecting to said slide;  
said guiding means guiding said first horizontal link in said cycle;  
said driving means including said guiding means; and  
said guiding means guiding said adjustment and said driving displacement to said slide whereby said stroke is adjusted.

5. A slide drive device, according to claim 4, further comprising:  
a crank shaft;  
at least a first connecting rod on said crank shaft;  
said connecting rod receiving a reciprocating motion and transmitting said reciprocating motion to said means for driving;

said connecting rod and said means for driving being effective to transmit said reciprocating motion to said dynamically balancing means; and  
said guiding means being effective to convert said reciprocating motion to a guiding displacement, whereby said slide operates in said cycle.

6. A slide drive device, according to claim 5, further comprising:  
said at least first upper link having a first length (a);  
at least a first middle link;  
a center fulcrum pin on said first middle link;

said first upper link operably connecting to said first middle link at said center fulcrum pin;

a first and second end on said first middle link;

said first connecting rod operably coupled to said second end;

5 said first middle link having a second length (b) from said first end to said center fulcrum pin;

said first middle link having a third length (c) from said second end to said center fulcrum pin; and

said first, second, and third lengths having the following relationship:

10 
$$(a):(b) = (b):(c) \quad (V)$$

whereby said first connecting rod transmits said driving displacement to said first upper link and said first middle link and driving means reduces a slide speed adjacent said bottom dead center position and increases said slide speed distal said bottom dead center position.

15 7. A slide drive device for a press machine having a slide, comprising:

a slide;

said slide having a top and a bottom dead center position;

adjusting means for adjusting a stroke of said slide;

20 said adjusting means simultaneously adjusting said top and bottom dead center positions by a same amount;

said adjusting means being located at the same location on said press machine;

driving means for permitting driving of said slide drive device;

at least a first upper link;

said first upper link being connected to drive said slide in said cycle;  
said driving means transmitting a driving displacement to said slide to  
drive said slide in said cycle; and  
said means for driving transmitting said adjustment to said slide whereby  
5 said stroke is adjusted.

8. A slide drive device, according to claim 7, further comprising:  
guiding means for guiding of said slide drive device;  
at least a first horizontal link;  
a second linear guide;  
10 a second slider operably slidable in said second linear guide;  
said one horizontal link operably joined to said second slider;  
said second slider receiving said driving displacement from said driving  
means;  
said guiding means being effective to guide said adjustment to said slide;  
15 and  
said first horizontal link driving said slide in said cycle whereby said  
stroke is adjusted and said top and bottom dead center positions are adjusted by  
the same amount.

9. A slide drive device, according to claim 8, further comprising:  
20 dynamically balancing means permitting dynamic balancing of said slide  
drive device;  
said dynamically balancing means connecting a dynamic balancer to said  
slide;  
said dynamically balancing means connects to operate said dynamic  
25 balancer opposite said slide;

said dynamically balancing means receiving said guiding displacement;  
and

said dynamically balancing means being effective to operate said dynamic balancer opposite said slide whereby said dynamically balancing means and said dynamic balancer counter a momentive force of said slide in said cycle and substantially lower vibration in said slide drive device.

10. A slide drive device, according to claim 9, further comprising:

a crank shaft;

a center of said crank shaft vertically aligned with said second slider;

at least one of a first and second eccentric part on said crank shaft;

said first and second eccentric parts diametrically opposed on said crank shaft;

said first and second eccentric parts balanced about a rotation center of said crank shaft;

at least one connecting rod on said one eccentric part;

said connecting rod receiving a reciprocating motion and transmitting said reciprocating motion to said driving means;

said driving means being effective to transmit said reciprocating motion to said dynamically balancing means; and

guiding means being effective to convert said reciprocating motion to a guiding displacement, whereby said slide operates in said cycle.

11. A slide drive device, according to claim 10, further comprising:

a small and a large end on said one connecting rod;

said large end operably attached to said one eccentric part;

said small end operably attached to said driving means; and

said small end reciprocating linearly to a rotation center of said crank shaft  
whereby said driving displacement is transmitted to said slide.

12. A slide drive device, according to claim 11, further comprising:

at least a first upper link;

said first upper link operable about a fixed fulcrum pin;

said at least one upper link having a first length (a);

at least a first middle link;

a center fulcrum pin on said first middle link;

said first upper link pivotably joined to said one middle link at said center  
fulcrum pin;

a first and second end on said one middle link;

said one connecting rod operably coupled to said second end;

said one middle link having a second length (b) from said first end to said  
center fulcrum pin;

said one middle link having a third length (c) from said second end to said  
center fulcrum pin; and

said first, second, and third lengths having the following relationship:

$$(a):(b) = (b):(c) \quad (VI)$$

whereby said one connecting rod transmits said driving displacement to  
said first upper link and said first middle link and said driving means drives said  
slide in said cycle and reduces a slide speed adjacent said bottom dead center  
position and increases said slide speed distal said bottom dead center position.

13. A slide drive device, according to claim 12, further comprising:

a guide pin;

said guide pin guiding said dynamic balancer opposite said slide;

a balancer pin;

said balancer pin operably joined to said dynamic balancer;

a balancer link;

5       said balancer link operably joining said balancer pin to said one connecting rod;

      said balancer link receiving said driving displacement and transmitting said guiding displacement to said dynamic balancer whereby said dynamic balancer operates opposite said slide and substantially eliminates vibration; and

10       said dynamic balancing means having a shape adapted to said driving means whereby said slide drive device is compact in size.

14. A slide drive device, according to claim 13, wherein:

      said balancer pin is vertically aligned with said fixed fulcrum pin.

15       15. A slide drive device, according to claim 14, further comprising:

      a first linear guide;

      said first linear guide vertically aligned with said fixed fulcrum pin and said balancer pin;

      a first slider operably slidable in said first linear guide;

      said first end of said one middle link operably joined to said first slider;

20       said one middle link operably transmitting said driving displacement from said one connecting link to said first slider;

      at least one of a first and second lower link;

      a first and second side on said one horizontal link;

      said first side operably joined to said second slider;

25       said second side operably joined to said one lower link;

said one lower link operably joining said first slider and said one horizontal link; and

said first slider being effective to convert said driving displacement to a linear displacement whereby said one lower link operably drives said one horizontal link and said slide in said cycle.

16. A slide drive device, for a press machine having a slide, comprising:  
a crank shaft;

at least a first eccentric part on said crank shaft;

a second eccentric part on said crank shaft

said first and second eccentric parts operably opposing each other about a rotation center of said crank shaft;

at least one of a first and second connecting rod;

said one connecting rod operably joined to said one eccentric part;

said one connecting rod receiving a driving displacement from said crank shafts;

at least one of a first and second upper link;

said one upper link operable about a fixed fulcrum pin;

at least one of a first and second middle link;

said one middle link having a first and second end;

said one connecting rod effective to transfer said driving displacement to said one middle link at said second end;

said one upper link operably joined to said one middle link at a center fulcrum point between said first and second ends.

said one middle link effective to transfer said driving displacement to said one upper link;



said one middle link and said one upper link operably effective to transfer said driving displacement to a slide and drive said slide in a cycle;

said one connecting rod having a having a length (a)

said center fulcrum point a length (c) from said second end;

said center fulcrum pont a length (b) from said first end; and

said lengths (a), (b), (c), having the following relationship:

$$(a):(b)=(b):(c) \quad (VII)$$

whereby said one connecting link operates horizontally to said crank shaft and said one upper link and said one middle link are effective to transfer said driving displacement to said slide and drive said slide in said cycle at a low speed adjacent said bottom dead center for increased force and a fast speed distal said bottom dead center for a speedier return.

17. A slide drive device, according to claim 16, further comprising:

means for adjusting said slide drive device;

a top and a bottom dead center position of said slide;

said adjusting means permitting adjustment of a stroke of said slide;

said adjusting means permitting adjustment of said top and bottom dead center position at the same time;

said adjusting means permitting said adjustment of said top and bottom dead center positions by the same amount;

at least one of a first and second horizontal link;

a first and second end on said one horizontal link;

said one horizontal link effective to receive said driving displacement at said second end;

said one horizontal link effective to receive said adjustment at said first end; and

said one horizontal link effective to transfer said driving displacement and said adjustment to said slide whereby said slide is adjusted and driven in said cycle.

18. A slide drive device, according to claim 17, further comprising:

means for dynamically balancing said slide drive device;

said dynamic balancing means operably moving a dynamic balancer opposite said slide in said cycle;

a guide pin operably guiding said dynamic balancer during said cycle;

said guide pin vertically aligned with said fixed fulcrum pin;

said dynamic balancing means driven by said one connecting rod; and

said dynamic balancing means being effective to counter a momentive force of said slide and said one connecting rod whereby said slide operates in said cycle with substantially lower vibration.